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Appraising the impact and role of platform models and Government as a Platform (GaaP) in UK Government public service reform: towards a Platform Assessment Framework (PAF)

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ABSTRACT

The concept of “Government as a Platform” (GaaP) (O’Reilly 2009) is coined frequently, but interpreted inconsistently: views of GaaP as being solely about technology and the building of technical components ignore GaaP’s radical and disruptive embrace of a new economic and organisational model with the potential to improve the way Government operates – helping resolve the binary political debate about centralised versus localised models of public service delivery. We offer a structured approach to the application of the platforms that underpin GaaP, encompassing not only their technical architecture, but also the other essential aspects of market dynamics and organisational form. Based on a review of information systems platforms literature, we develop a Platform Appraisal Framework (PAF) incorporating the various dimensions that characterise business models based on digital platforms. We propose this PAF as a general contribution to the strategy and audit of platform initiatives and more specifically as an assessment framework to provide consistency of thinking in GaaP initiatives. We demonstrate the utility of our PAF by applying it to UK Government platform initiatives over two distinct periods, 1999-2010 and 2010 to the present day, drawing practical conclusions concerning implementation of platforms within the unique and complex environment of the public sector.

Keywords: Platform, Ecosystem, Government as a Platform, GaaP, Digital Government.

1. Introduction

The “shared plumbing” of the Internet has ushered in an era of net-enabled business transformation, or NBT (Straub and Watson 2001; Barua 2004), enabling organisations to reconfigure their interactions with customers and suppliers to improve their financial and operational performance (Barua et al. 2004). This has been accompanied by the adoption of a “service-dominant logic” (Lusch and Nambisan 2015) whereby services rather than products have become the focus of business – a perspective likened to moving from selling mousetraps to offering “rodent relocation services” (Bettencourt 2010). Both NBT and the move towards service arise, in part, because of the opportunities provided by the Internet for consuming standard, commoditised process capabilities (Davenport 2005) and content (Iyer and Davenport 2008) from others, rather than generating everything from within a single organisation.

This commoditisation of services has provided significant economies of scale, with costs spread across a large volume of standardised components. For example, many low-cost airlines harness Internet services from Navitaire, which is why so many online booking processes look remarkably similar. A distinctive new form of organisation to emerge from this interaction between Internet

infrastructure, NBT and servitisation has been defined as the platform-ecosystem (examples include companies such as Apple, Google, Airbnb, Netflix, Spotify, Twitter, eBay, or Alibaba). Platform-ecosystems typically comprise a combination of core technology components made by a platform owner together with a wide range of external participants, both organisations and individuals, who complement the platform with applications and services that provide solutions that enhance and extend those created by the original platform owner. In the case of Google, for instance, provision of easily-shared technology infrastructure in the form of the open Android platform for smartphones has enticed a service ecosystem of content providers, consumers, innovators and investors. Similarly Apple's iOS platform has led to the creation of 1.4 million "apps".

Such platforms comprise interdependent components or subsystems within an evolving technological system (Gawer & Henderson 2007) around which buyers and sellers co-ordinate (Bresnahan and Greenstein 1999). They are increasingly reliant on cloud computing services (Venters & Whitley 2012). Vital to platform ecosystems is an architecture of related standards (e.g. Internet standards like TCP/IP) (Hatchuel et al. 2010; West 2003). These open standards provide the rules which establish compatibility between components to allow platform-ecosystems to continually evolve (Brown et al. 2014). For example, such standards allow services to be built through so-called "mashups", where "a mashup is an application which combines data and functionalities provided through web API¹s to create new services" (Yoo 2012:17) – just as AirBnB uses Google's Maps within its offering.

Increasingly, organisations are able to run standard business processes by consuming interdependent "mashed-up" components organised around platforms of common components, subsystems, and standards (Vargo & Lusch 2008). The implications for organisations seeking to adopt NBT and servitisation are a need to re-organise their own resources around the linkages between internet-based technology, the opportunities for process innovation, and the consumption logic of services – as well as a mature approach towards, and relationship with, the surrounding network (Lusch & Nambisan 2015; Brown et al. 2014).

To date however, there has been little consideration of these implications for public services: as we show in our literature review, the topics of NBT and servitisation remain generally unexplored in the literature. Yet while academic interest has been somewhat sparse, Governments, and the UK in particular, have demonstrated practical interest in the concept of platforms (GDS 5; GDS 8; GDS 12; GDS 13; GDS 21; GDS 23). Indeed it is little exaggeration to state that digital "platforms" have become increasingly viewed within public services as "the answer" to the need for fundamental, Internet-enabled, transformation, recently attracting £1.8bn of direct investment in the UK for digital transformation and an additional £450m specifically for the Government Digital Service in November 2015 (CS1).

But what will such a platform approach mean for Government? The public sector differs in fundamental ways from the private sector, notably in areas such as the universality of its services, rather than being able to serve only a subset of the population. How well might some of the Internet-enabled transformations seen in the private sector adapt to the public sector? Perhaps the best-known attempt to conceptualise the extent to which the Internet could change Government is O'Reilly's (2009) notion of "Government as a Platform", or "GaaP", which describes a use of collaborative technologies to enable more participatory Government and better solve collective problems at a city, region, national, and international level. Of interest for our purposes is O'Reilly's specific use of the term "platform", where he contrasts Raymond's (2000) "cathedral" (top-down), model of organising with the "bottom-up" notion of a "bazaar":

In the technology world, the equivalent of a thriving bazaar is a successful platform. If you look at the history of the computer industry, the innovations that define each era are frameworks that enabled a whole ecosystem of participation from companies large and small. The personal computer was such a platform. So was the World Wide Web. This same platform dynamic is

¹ API: Application Programming Interface. An interface that enables access to a system's processes and data. APIs can be used for computer-to-computer interactions as well as by a user interface, such as a web page or mobile application.

playing out right now in the recent success of the Apple iPhone ... This is the right way to frame the question of Government 2.0 (O'Reilly 2010).

GaaP emphasises the role of citizen engagement, including participation in the policy process. It thus partially echoes the earlier definition of e-Government, with its emphasis on citizen engagement, consultation and informed participation to develop policies that better address citizens' needs and hence increase support for, and trust in, Government and its policies (OECD 2003:84). However, the notion of "platform" holds a specific connotation for Government, which becomes a "convener and an enabler rather than the first mover of civic action" (ibid.). Investigating platform models in Government thus becomes a question of:

How does government become an open platform that allows people inside and outside government to innovate? How do you design a system in which all of the outcomes aren't specified beforehand, but instead evolve through interactions between government and its citizens, as a service provider enabling its user community? (O'Reilly 2010).

To explore these ideas of platforms and Government as a Platform, this paper proceeds as follows.

In the next section, we perform a comprehensive review of existing IS literature. We show that Government literature has not yet engaged extensively with the notion of shared information infrastructure – despite the Internet being perhaps the most significant enabling infrastructure for the construction of new forms of Government. Drawing on the IS literature, we identify a much more significant dimension to GaaP, a new, Internet-enabled organisational form for Government. We draw the insights from our literature review into a Platform Assessment Framework (PAF).

We then apply the PAF by undertaking an extensive analysis of the literature associated with the UK Government's e-Government and digital Government initiatives. Our analysis shows that rather than concentrating on the business model possibilities afforded by the shared infrastructure of the Internet, the primary focus has been the subset of potential enabled by a Web "front end", with a particular emphasis on taking existing services and information and putting them online (Cabinet Office 1999; GDS 24) on Government Websites.

We conclude by arguing that this approach risks leaving underlying organisational silos, processes and the design of public services largely untouched, continuing much as they were before the Internet, rather than enabling the type of fundamental service transformation foreseen by O'Reilly and witnessed in other digital organisations (Brown et al. 2014). Such an undifferentiated approach appears likely to offer little greater success than earlier Government initiatives, such as the adoption of Taylorism and New Public Management, to adopt private sector models to improve public services.

2. Literature Review

2.1 Research Methodology

Within the paper we adopt a two stage strategy to evaluate the UK Government's GaaP approach. First (in this section) we synthesise systematically our platform assessment framework (PAF) - first by reviewing relevant Government technology papers and books, then by systematically analysing the Information Systems (IS) literature. This framework thus represents the key conceptual ideas within the current IS literature dealing with platforms, and informed by the Government technology literature. Next (in section 3) we develop an historical account of the UK Government's approach to platforms over two distinct time periods: 1999-2010, and 2010 to the present day, applying our PAF to the analysis of these accounts in order to derive lessons for research and policy.

Evidence for this account comes from varied Government documentation, political documents and grey-literature (e.g. blogs, industry-newspapers, Websites etc). Navigating this literature is difficult and we therefore rely upon three co-authors who were involved in Government IT policy and delivery during this period. This experience allows them to act as experts in synthesising these documents into a coherent account. While this methodology is open to criticism of their potential to be partial in the

account, we have taken great pains to be reflexive on these potential biases during writing of the paper (Alvesson & Skoldberg, 2000). In addition, the fourth author has adopted an explicit “devil’s advocate” position – probing and questioning for bias in the writing process. Ultimately however by using a wide volume of this secondary literature, and quoting it extensively, we hope to demonstrate rigour within the account. Following this account, the PAF is used to evaluate and critique the UK’s platform strategy and to devise theoretical and practical contributions to both Government technology policy and the broader public sector literature.

For the IS literature review, following Henfridsson and Bygstad (2013) and drawing upon Webster and Watson (2002), in 2015 we undertook a concept-centric review of literature on platforms within the information systems literature. In addition to this systematic trawl, relevant e-Government and digital Government literature was also reviewed as were relevant books and conference papers on an ad-hoc basis. We selected the AIS (Association of Information Systems) basket of eight journals considered pre-eminent in information systems and primary sources for platform literature (MISQ, JIT, ISJ, JSIS, EJIS, ISR, JMIS, JAIS), adding four additional journals known for this type of article (I and O, ITP, Information Society, CSCW). Using the ProQuest database, we selected articles from the last 10 years which included the word “platform” within their title, abstract or keywords. This yielded 110 papers which were briefly read. Those considered irrelevant were rejected (i.e. where platform was not central to the paper) leaving fifty core papers. These papers were reviewed in detail and descriptive summaries prepared. Each of the four authors then separately synthesised key concepts and features from the table and corpus which were then clustered during a workshop in which three key dimensions emerged.

2.2 Background

We draw on Gawer and Cusumano’s (2002) definition of a platform as “an evolving system made of interdependent pieces that can each be innovated upon”. In this view, platforms lead to increasing interdependency and complementarity of products and services. These authors identify three types of platform:

- **internal platforms:** a set of subsystems and interfaces internal to the organisation that have been intentionally planned and developed to form a common structure from which a stream of derivative products can be efficiently developed and produced (e.g. Sony’s Walkman, Hewlett-Packard’s modular printer components, Rolls-Royce’s family of aero-engines), saving fixed costs, benefiting from component re-use, and enabling flexibility.
- **supply chain platforms:** which replicate the benefits of internal platforms across interfaces amongst different organisations within a supply chain – most notably, the automotive industry: for example, the Renault-Nissan alliance which developed a common platform for the Renault Clio and the Nissan Micra
- **industry platforms:** “products, services or technologies that are developed by one or several firms, and which serve as foundations upon which other firms can build complementary products, services or technologies”, such as Microsoft’s Windows operating system, Intel microprocessors, Apple’s iPhone, the internet, payment cards, and fuel cell automotive technology

This last conception of platform, as the foundation for activity by others, creates value “primarily by enabling direct interactions between two or more customer or participant groups.” Such platforms offer services to distinct categories of users, where each depends on the other in some important way, and whose joint participation makes the platform more valuable to each other (Eisenmann, Parker, & Alstyne, 2006).

Building on this foundational nature of industry platforms, a further construct, “Open Platforms”, has been defined (Fishenden & Thompson, 2013) as “freely available, standard definitions of service

outcomes, processes, or technology that encourage multiple users to converge on utility consumption of services based on these definitions – which in turn encourages suppliers to innovate around these commodities”. An example is the way in the UK that common acceptance of a 230v standard for electricity consumption constitutes a powerful platform for innovation and investment in a whole ecosystem of related products and services (Brown et al, 2014:118). In assessing the impact and role of platform models in the UK Government, it is this “open platform” definition that resonates most closely with the role of a publicly-owned “convener and enabler” such as that envisaged in O’Reilly’s GaaP: publicly available open standards regarding service outcomes, processes or technology which facilitate joint social and economic participation by Government and a broad cross-section of users in public, private, and third sectors. Our use of the term “platform” throughout this paper thus encompasses Government’s use of Internet-based platform technologies (which we address in the literature review in the next section) to achieve a GaaP, or open platform-based business model, as defined above. The two constructs are highly compatible in the sense that the former is seen as potential enabler for the latter.

In general, the topics of NBT, servitisation and platforms remain underexplored in the Government technology literature. Government platforms have been studied in terms of motivations for participation (technical, political, economic and operational) (Fedorowicz, Gelinas Jr et al. 2009), and in understanding how their development might be enabled within existing Government activity. Here platforms are seen as significant in facilitating the collaboration and co-ordination necessary for lean Government initiatives (drawing upon “lean” business ideas) (Janssen & Estevez 2012). Platforms are argued to reflect a more general linking of digital technology with managerialism, founded upon an ontology of economic rationalism (Katsonis & Botros 2015), and are seen within transformative governance initiatives, requiring private support (Klievink, Bharosa et al. 2016).

A significant focus in Government technology research is the platform mediating between citizen and Government. For example, Lee & Kwak (2012) explore how social media may enhance citizen engagement, detailing how such engagement is inhibited by organisational, technological and financial constraints. Within such research, empowered citizens are theorised as co-producers of services whereby the Government must adopt roles such as “sponsor”, “mobiliser”, “monitor” and “provider of last resort” rather than that of core provider of services (Linders 2012). Similarly, open Government initiatives explore how platforms allow outside agencies and citizens to contribute (Millard 2013) allowing Government to “do more with more” resources (Millard *forthcoming*) and breaking down Government silos by providing a “broad platform for public value creation” (Millard 2013).

Research has outlined significant governance, cultural and leadership challenges of platform adoption (Katsonis & Botros 2015). Platforms can also challenge democratic accountability (van Dijck & Nieborg 2009), with, for example, Prince (2010a and 2010b) highlighting the significant difficulty of ensuring sufficient co-production of vital services and citizen accountability for providing them. Another area of concern is the impact of platforms, and in particular social media platforms, on political discourse and debate (Katsonis & Botros 2015), so affecting Government activity.

While the Government technology debate has proved useful, much of the existing focus has been centred around the establishment of Government on the Web. For example, social media and open Government initiatives are concerned with publishing existing information and transactions online, rather than on the wholesale reconceptualization of public services, processes and organisational structures in response to platforms as summarised in the introduction. Some major EU movements towards addressing such issues, and considering the wider architecture of digital government, include the European Interoperability Reference Architecture (EIRA), an architecture content metamodel defining the most salient architectural building blocks needed to build interoperable e-Government systems, and the Interoperability Maturity Model, which aims to assess the interoperability readiness of services and raise awareness of the need for interoperable solutions. Two contributions which

move beyond the Web focus of Government online are Dunleavy & Margetts (2010, 2013), and Fishenden & Thompson (2013). Dunleavy and Margetts propose that we have entered a time of “Digital-era Governance” (DEG), whose focus on re-integration, citizen-based services, and digitized processes, information and data, marks a decisive break with the preceding era of New Public Management, or NPM (e.g. Pollitt 2009). Fishenden and Thompson emphasise the innovative nature of the new business models and commercial incentives that will be required for DEG to become a reality – arguing that “DEG holds a specific set of implications for the role Government needs to play in its delivery ... to locate itself correctly within a distinctive emerging digital economy that will successfully allow it to deliver DEG-style services” (2013:6). In doing so, Fishenden and Thompson propose that Government can act as a steward of “open architecture” (rather than open Government): that is, nurturing ecosystems of networked activity around standardised, platform-type behaviours.

Given the paucity of research in this direction there is a clear need to enrich the Government technology literature with a stronger foundational understanding of the role platforms might play architecturally in Government activity. To address this gap, we systematically review the information systems literature which has considered platforms extensively and regularly with an architectural and structural focus. This literature is considered a reference discipline for e-Government research (Bannister & Connolly, 2015) and introducing its findings to the Government technology literature provides a contribution of this paper.

2.3 The Platform Assessment Framework (PAF)

This section presents the three key dimensions, together with their constitutive concepts and features, identified during our synthesis of IS literature. Central to our clustering of concepts and features into our three dimensions was an internal validity amongst the concepts and features within each dimension which were consistent with, and even co-constitutive of, one another.

2.3.1 Platform as collectively visualised organizational form

The first of the three dimensions distilled from our comprehensive review of the IS literature dealing with platforms is the *platform as collectively visualised organizational form* (Eaton, Elaluf-Calderwood, Sørensen, & Yoo, 2015). This dimension was distilled from a number of concepts and features identified individually within the IS literature. Underpinning the notion of platform as organizational form was the need for a participatory ecosystem which is visualisable (i.e. perceivable) as such by participants (e.g. (Anderson, Parker, & Tan, 2014; Busquets, 2015; Guo, Reimers, Xie, & Li, 2014). Such an ecosystem, and its underlying architecture, might vary considerably in its nature. For example, the Apple iOS mobile operating system (Eaton et al., 2015; Ghazawneh & Henfridsson, 2013) remains a closed platform controlled by Apple and is understood as such by participants. In contrast the Internet is an open platform where visible – and accessible – open standards, agreements and protocols bind its innovators collectively together, so enabling their innovation. Linking them is a collective understanding about the platform upon which they are innovating (Eisenmann et al., 2006).

This collective visualisation is significant, since platforms comprise networks of distributed stakeholders (Venters, Oborn, & Barrett, 2014) with a variety of relationships with the platform (Ceccagnoli, Forman, Huang, & Wu, 2012; Gnyawali, Fan, & Penner, 2010); the actions of any one stakeholder are contingent upon their understanding of the actions of the whole. Such actions, particularly the scope for innovation, by platform participants may be limited by the options available (Venters & Whitley, 2012) – for example eBay offers limited innovation (innovation in textual description and photos), whereas Apple’s iOS offers significant potential for innovation (developing applications) which must be made visible to potential innovators.

The view of the platform as a collectively visualised organisational form is impacted by the ongoing innovations and practices of all their stakeholders. This leads many to describe platforms in emergent terms – dynamic and so adapting and evolving over time (e.g. Anderson et al., 2014; Clemons, 2010; Koh & Fichman, 2014; Rai, Patnayakuni, & Nainika, 2006; Xu & Zhang, 2013). Significantly for our

research, some have suggested that the emergent nature of platforms calls for distributed rather than centralised governance arrangements (Ghazawneh & Henfridsson, 2015; Nielsen & Aanestad, 2006; Tiwana, Konsynski, & Bush, 2010). Indeed, the acknowledgement that platforms, and the value of platforms, are co-created by stakeholders (Ceccagnoli et al., 2012; Lusch & Nambisan, 2015) leads to a more general questioning of existing assumptions of platform control in favour of a more distributed governance arrangement (one in which shared visualisation remains important).

2.3.2 Platform as market dynamic

Deepening this emergent, dynamic view of platforms, many IS authors have pointed out that progressive commoditisation, market dynamics and incentives of the domain in which platforms reside influences a platform. Accordingly, our literature analysis yielded a second key dimension, in which platforms are conceptualized as *market dynamic*: an unfolding and complex process involving commoditisation and shifting incentives for participation. Authors subscribing to the “market dynamic” view highlight a number of concepts and features. First, digital platforms are components of a wider information infrastructure (Hanseth & Lyytinen, 2010) (e.g. Facebook relies upon the Internet, itself reliant on global telecommunications networks). Such higher-order infrastructure is increasingly commoditised (Jin & Robey, 2008; Nielsen & Aanestad, 2006; Wagelaar & Van Der Straeten, 2007) leading to strategic challenges for those seeking to govern platform evolution strategies. As control over the dynamics of a platform is limited by commoditisation (making substitution perhaps easier), to understand the longer-term dynamics of any platform we must examine platform engagement and thus evolution. Our review highlights the significance of incentives in encouraging platform engagement (Parker & Weber, 2014) and the need for balancing all sides of the platform (as a form of marketplace) (Bakos & Katsamakas, 2008; Granados, Kauffman, & King, 2008). Where there is a dominant platform controller (e.g. Apple over iOS), they often seek to enrich and diversify their value proposition through incentivising an ecosystem of third party innovators (Ghazawneh & Henfridsson, 2013) (e.g. Apple supporting sales by app developers). Incentives vary depending on the nature of the platform (e.g. 1, 2 or n sided (Koh & Fichman, 2014)) as price elasticity of demand can vary between sides, and consideration is needed of how to cultivate third parties to innovate the platform.

Our literature review suggests that trust and incentives are additional significant factors in the governance models and servitization strategies for platforms. Trust must be established carefully if a platform is to succeed (Holmqvist & Pessi, 2006) and relates to issues of control, with other parties potentially challenging platform trust (He, 2008) and asserting their own status (Levina & Arriaga, 2014) or control (Eaton et al., 2015). Accordingly, platform governance models should reflect this by requiring some form of democratic accountability for platform owners (Markus & Bui, 2012; Xu & Zhang, 2013). Governance is also required in ensuring the dynamic multi-sided markets of platforms operate effectively through market design activity (Bakos & Katsamakas, 2008; Bichler, Gupta, & Ketter, 2010; Kuk & Janssen, 2013). Such activity must consider incentives, attitudes and local conditions (Bakos & Katsamakas, 2008; Levina & Arriaga, 2014) alongside price competition where relevant (Lin, Li, & Whinston, 2011). Incentives are also associated with barriers of entry to a platform (which, with GaaP, may have political dimensions, particularly where democratic accountability is changed) (Rose & Saebo, 2010). Platforms have a dynamic, self-organising nature (Nan & Lu, 2014) such that the impact of incentives is not always predictable; incentives need to be balanced between conflicting demands, for example between innovating the platform, increasing participation, and protection of those using the platform (e.g. privacy and security) (Markus & Bui, 2012). Incentives must also be balanced with possible unintended consequences of platform innovation and exploitation which may challenge the platform (Chan & Ghose, 2014; Srinivasan, 2014). Finally, incentives must also be designed with regard to the context of those who remain non-adopters of the platform (Carlo, Gaskin, Lyytinen, & Rose, 2014; Napoli & Obar, 2014). Dependent on the resolution of these tensions, digital platforms might be defined as “closed, censored, focused, and open” marketplaces (Ghazawneh & Henfridsson, 2015).

Throughout our literature review, it was clear that the importance of contextual factors associated with the domain within which the platform resides (e.g. drugs supply or healthcare (Guo et al., 2014; Ozdemir, Barron, & Bandyopadhyay, 2011; Tempini, 2015)) were downplayed by a tendency towards generic abstraction, something we contest may be highly significant for considerations of GaaP – for which Rose (Rose & Saebø, 2010) highlights the citizen and politician as potential contextual factors. The need to factor in the sorts of nuanced contextual considerations summarised above is all the more important, given the paradoxical tension between the democratic, generative nature of platforms and attempts to assert control by platform developers and owners; local resolutions of this tension can mean that power remains unevenly distributed within many platforms (Eaton et al., 2015).

2.3.3 Platform as architectural structure

In contrast to the emphasis on dynamic process that underpins the previous two dimensions, many IS authors draw lessons concerning the static architectural structure of platforms. This gives rise to our third dimension of *platform as architectural structure*. Here we are bracketing out of our analysis the technical specifics of platform technology (for example, while virtualisation has had an impact on cloud computing platforms (Venters & Whitley, 2012), we are not considering such technical innovations here). We therefore constrain our analysis of architecture into issues of boundary and process. “Boundary” concerns the contextual boundary within which platforms exist, in particular the APIs and interfaces relied upon in innovating on a digital platform and which must be managed over time (Jin & Robey, 2008). “Process” emphasizes platforms’ and ecosystems’ modular interlinking processes, enabled by shared infrastructure.

If information infrastructures can shape gains in higher-order capabilities for organisations (as Rai et al. (2006) discovered) and thus organisational performance, so platform architecture unbundles existing business processes, isolating those improved by a technology platform, and focusing organisations on desired outcomes rather than existing processes (Anderson et al., 2014; Nielsen & Aanestad, 2006). Many of these insights emerge from supply-chain research where modular interlinking processes create tight-coupling between agents harnessing a platform. As an example, Malhortra et al. (Malhotra, Gosain, & El Sawy) identify five supply chain partnership configurations (collectors, connectors, crunchers, coercers, and collaborators) in their discussion of the level of coupling between platform participants.

Ideas of loose and tight coupling (Nielsen & Aanestad, 2006) are important for platform designers in defining the level of modularity and integration (Schilling, 2000) that can be achievable by participants within a platform ecosystem – and thus enabling or constraining its unfolding dynamics. The ability to control the dynamic evolution of a platform is influenced by the modularity and openness of the architecture (Busquets, 2010) – an architecture which itself is a co-ordination device for the platform (Tiwana et al., 2010). Ideally, a platform architecture must enable components to be changed while the whole continues to function such that “tight-loose” styles of governance are achieved (Tiwana et al., 2010). For this to happen, interfaces and boundaries become critical features of any platform architecture. If an optimal balance between tight-loose is achieved, a platform architecture may achieve a further aim: enabling its own promotion, as participants in the platform enrol others (Koh & Fichman, 2014) (e.g. as viral marketing or political subversion spreads through social media platforms (He, 2008; Palka, Pousttchi, & Wiedemann, 2009)).

2.3.4 The IS Literature Dimensions of our Platform Assessment Framework (PAF)

Table 1 draws together the three dimensions of organizational form, market dynamic, and architectural structure distilled from the IS literature on platforms, shown with their constitutive concepts and features. These three themes offer a useful way of conceptualizing current thinking about platforms by IS scholars. Importantly for the analysis that follows, we have found that the operation of any one dimension presumes the operation of the two others. That is, the concepts and features of any one dimension are only explainable in the context of the concepts and features of the others.

Dimension arising from literature review	Organisational form ‘Platform-ecosystem as collectively visualised organisational form’	Market dynamic ‘Platform-ecosystem as complex dynamic of commoditisation and shifting incentives for participation’	Architectural structure ‘Platform-ecosystem of modular interlinking processes, enabled by shared infrastructure’
Constitutive concepts and features within each dimension	<p>Visualisable ecosystem and underlying architecture (Anderson 2014; Busquets 2015; Guo 2014)</p> <p>Need for collecting understanding about nature of platform (Eisenmann 2006)</p> <p>Varied repertoire of actions towards the platform (Gynawali 2010; Ceccagnoli 2012)</p> <p>Generative innovation limited to variety of available tailoring (Venters 2012)</p> <p>Platform as dissolved organisational form based on emergent practices (Eaton 2015)</p> <p>Platforms models are dynamic and adaptive over time (Rai 2006; Clemons 2012; Xu 2013; Anderson 2014; Koh 2014)</p> <p>Platform models conceptualised as holistic ecosystems with distributed rather than centralised governance (Nielsen 2006; Ghazawneh 2015; Tiwana 2010)</p> <p>Value of platforms is co-created by stakeholders (Ceccagnoli 2012; Lusch 2015) requiring plural governance arrangements</p>	<p>Recognition of implications of platforms’ existence within increasingly commoditised information infrastructures (Hanseth 2010; Wagelaar 2007; Jin 2008; Nielsen 2006)</p> <p>Significance of incentives in driving engagement with platforms (Parker 2014); Incentives will vary with nature of platform to reflect demand elasticity on each side (Koh 2014)</p> <p>Need to balance supply- and demand-sides of platform as a marketplace (Granados 2008; Bakos 2008); Market design activity and governance required to enable multi-sided platforms to operate (Bichler 2012; Bakos 2008; Kuk 2013)</p> <p>Enrichment and diversification of platform proposition via attracting ecosystem of innovators (Ghazawneh 2013)</p> <p>Trust is essential in servitisation strategies for platforms (Holmqvist 2006); Trust relates to perceived degree of control (He 2008), which is open to challenge (Levina 2014; Eaton 2015)</p> <p>Need for platform governance models to reflect importance of trust via democratic accountability for platform owners (Xu 2014; Markus 2012)</p> <p>Governance must consider incentives, attitudes and local conditions (Bakos 2008; Levina 2014; Carlo 2014; Napoli 2014) and politics (Rose 2010) alongside price competition (Lin 2011)</p>	<p>Importance of managing APIs and other interfaces of platform-ecosystem over time (Jin 2008)</p> <p>Information infrastructures can shape gains in higher-order capabilities for organisations (e.g. Rai 2006); need to recognise this affordance of platforms</p> <p>Platform architecture unbundles business processes, refocusing on desired outcomes of such processes rather than processes themselves (Nielsen 2006; Anderson 2014)</p> <p>Modular, interlinking processes can create tight coupling between platform participants (Malhortra et al. 2005)</p> <p>Notions of tight and loose coupling (Nielsen 2006; Tiwana 2010) are useful in defining desired levels of platform-ecosystem modularity (Schilling 2000)</p> <p>Extent of modularity will influence ability to control dynamic evolution of platform (Busquets 2010)</p> <p>Architecture as co-ordination device for platform (Tiwana 2010)</p> <p>Platform architecture can support ‘viral’ self-promotion, with participants enrolling others (Palka 2009; He 2008)</p>

Table 1: Dimensions and constitutive features of the Platform Assessment Framework (PAF)

3. Framework Application

Having conducted our review of the treatment of platforms within the IS literature, and distilled this into a Platform Assessment Framework, we can describe, and then apply our Framework to assess UK Government initiatives. We outline e-Government / digital Government initiatives to develop common components as platform plays from the late 1990s onwards, and more recent developments from 2010 onwards. After a background summary of the period prior to 1999, our proposed PAF is applied as a lens to assess post 1999 initiatives and understand the extent to which they demonstrate recognisable platform models. We aim to show how the PAF can be a practical tool to validate and ensure platform models are properly balanced between all elements, rather than focusing for example solely on technical components, and hence stand a better chance of success. Importantly, the PAF is also intended to inform the consideration and evaluation of platform thinking in relation to the specific complexity of Government, and to avoid the wholesale import of private sector ideas evidenced in earlier failed initiatives, such as the indiscriminate adoption of Taylorism and New Public Management.

3.1 Technology and Public Service Reform to 1999: A Background

Prior to our analysis of the UK Government's platform initiatives since the late 1990s, we first contextualise them within the wider agenda of public service reform. Whilst this period is not a formal part of our analysis, it provides a valuable context for the later periods that we discuss.

As far back as 1918 the "Report of the Machinery of Government Committee" (Haldane 1918) aimed to improve the allocation of Government activities between Government departments, noting "there is much overlapping and consequent obscurity and confusion in the functions of the Departments of executive Government." By the late 1950s it was predicted that information technology would create radical changes in organisations' administrative practices (Leavitt and Whisler 1958). Technology was seen as a means of enabling Government administrative reform (Weiner 1969), and regarded as a "... catalyst for social, economic and political change at the levels of the individual, group, organisation and institution." (Fountain 2002:45). The application of modern technology was seen by some as a way of improving the way that Government worked, with the use of technology not merely a supporting function, "but coincides with the primary process and touches Government at its core" (DMIKR 2001:9), whilst others, such as Margetts & Willcocks (1993), noted that some major trends in public administration leave the sector particularly vulnerable to risks introduced by IT and at risk of "disaster faster".

In 1994, the use of IT as part of cross-Government public service reform began with the launch of the first UK online portal, the Government Information Service (HOCL 1994). The "Government Direct" green paper of 1996 subsequently positioned itself as a prospectus for the electronic delivery of Government services (Cabinet Office 1996). It promised to change fundamentally and for the better the way that Government provides services to citizens and businesses, and anticipated that online services would become "more accessible, more convenient, easier to use, quicker in response and less costly to the taxpayer. And they will be delivered electronically." (Cabinet Office 1996:1).

The Parliamentary Office of Science and Technology (POST 1998) considered a range of IT-enabled options for the future, an adapted form of which is shown in Table 2.

Option	Description
Business as usual	Departments and agencies could continue to adopt IT to meet their own needs on an independent basis

Improved co-ordination	Government could seek to achieve better co-ordination and use of resources between departments and agencies through joint implementation of IT projects such as ‘one stop shops’ for small businesses, enabling Government to appear ‘holistic’ from the outside but without a significant impact on departments’ and agencies’ current working models
Re-engineering	Government could be re-engineered around common processes

Table 2: Options for future Government services (adapted from POST, 1998)

POST considered several approaches to how the re-engineering option in Table 2 might be achieved, with the most radical approach being to follow the example set by leading businesses and to re-engineer Government departments and agencies around common processes. The critical issues POST considered relate to the scope of such a transformative change, whether it should be applied within existing departmental boundaries, across the whole of central Government, or spread wider to include other public and/or private bodies. They also considered the basis of such re-organisational models: whether, for example, services should be remodelled along process lines or orientated around citizens’ needs associated with life events (POST 1998:53), mirroring similar issues to those Haldane’s committee considered in 1918.

The general assumption of technology-enabled reform has long been that it will inexorably drive “... service organisations, including those in the public sector, towards profound transformations in the design of their production processes and structures.” (Bellamy & Taylor 1994). This is contrary to evidence from Margetts & Willcocks (1993) and numerous reports over many decades from the likes of the UK’s National Audit Office into failed “IT programmes”. Despite this evidence to the contrary, the underlying assumption about the role of technology within public service reform has continued to pursue a vision of fundamental transformation of the structures, operations and culture of Government (O’Donnell et al. 2003). Such reform envisages technological innovation acting as the disruptive catalyst for nonlinear and unpredictable societal change, with an impact that extends even into the upper levels of the political system and hence challenges the existing functions and structures of the state itself (Peristeras et al. 2002). The OECD describes this process of technology enabled reform as being about transforming the “... structures, operations and, most importantly, the culture of Government. Modernising Government ... will have fundamental impacts on how services are delivered, how policies are developed and how public administrations operate.” (OECD 2003:17).

The intended role of technology in Government has thus moved well beyond the automation of existing processes, information management and services into one of fundamental changes to processes at all levels (Mooney et al. 1996). The public sector aims to use technology “to find out people’s needs much more sensitively than ever before, and then put its resources into front-of-house service provision that meets those needs rather than back-office managerial imperatives” (Bastow et al. 2000:21). Existing literature that positions the role of technology as an agent of profound reform in public services mirrors the consensus within mainstream IS literature that this will require attention to conceptualising and incentivising the emergence of a fundamentally different organizational form (Kraemer & King 2003; see also Peters & Pierre 1998).

3.2 UK Government Platforms: Initiatives from 1999 until 2010

3.2.1 Narrative

From the late 1990s onwards, numerous organisations developed central infrastructure designed around agile enterprise architectures that used discrete, composable platforms to expose and share common data and processes (Krafzig et al. 2004). Governments, including the UK, Estonia (Estonia 2015) and Canada (Canada 2006), adopted a similar approach.

The architectural model adopted by successive UK Government initiatives has broadly implemented a high level model first articulated in 1999 (Cabinet Office 1999). This three-tier architectural structure aimed to insulate the delivery channels used by citizens for accessing public services from the complexity of Government’s existing back office. This was to be achieved by the creation of a middle tier between the front end channels (e.g. mobile, Websites, kiosks, PC applications) and the

departmental back end systems (e.g. Government departments line of business systems, from taxation to welfare). The vision was that this middle tier (or “gateway” as it was termed), through its use of open technical standards for interoperability (both data and interfaces), would enable systems to interact across Government without the need for knowledge of other components’ location, data formats, hardware platform, or implementation technology.

The emphasis on open technical standards aimed to provide an implementation that could link existing services and systems to a wide range of access channel technologies:

“This means that open standards need to be proscribed and that the interface standards needed to ensure good interworking must be defined. An open architecture will maximise the flexibility and opportunities for infrastructure provider competition. Every major interface in the architecture will need to have an interface specification defined for it. This will allow architectural components, services and supplier systems to be replaced easily and a ‘plug and play’ approach to be taken to architecture components, services and supplier systems.” (Cabinet Office 1999:6).

To realise this tiered implementation architecture, from 2000 onwards a central infrastructure, comprising a series of composable platform components, was developed by the Cabinet Office working in conjunction with several major departments, notably HMRC (taxation) and DWP (welfare). The intention was to implement a cross-Government technical architecture constructed on open, interoperable standards and services focused on the citizen rather than the owning departments or agencies. These platforms could be utilised across Government, making it easier to combine the right blend of services to meet their specific needs. The assumption was that it would be easier, less expensive and more efficient for Government to transform and improve its services by making use of this common infrastructure rather than each independently developing their own local services.

The UK Government’s GovTalk initiative was introduced to ensure a consistent approach through an agreed set of open technical standards spanning interoperability and metadata standards, the use of agreed schema (Cabinet Office nd1) and a Government Data Standards Catalogue (Cabinet Office nd2). The Cabinet Office of the UK Government established cross-Government interoperability requirements via the eGovernment Interoperability Framework (eGIF), which existed from 2000 to a final version in early 2005 (Cabinet Office 2005). The eGIF set out to adopt Internet and World Wide Web standards for all public sector systems (Cabinet Office 2004) in pursuit of its vision of interoperable components.

Behind the middle tier, the existing systems of the various Government departments and agencies spanned a wide variety of often proprietary technologies. These systems were to be integrated into the open standards components via a series of adaptors designed to translate between these proprietary technologies and those of the open, cross-Government architecture. As recently as 2013 an estimated £480 billion of UK Government revenue was still reliant on such legacy departmental systems (NAO 2013), highlighting the importance of an architecture capable of integrating existing systems. Legacy systems still remain “...a barrier to the rapid introduction of new policies and particularly the move to ‘digital by default’. Legacy ICT reduces the flexibility to improve public services, makes it harder to protect against evolving cyber threats and increases Government’s reliance on long-term contracts with large ICT companies. It is also likely to increase the cost of operating public services by preventing higher levels of automation and hindering data sharing intended to prevent fraud and error.” (NAO 2013:5)

During the period 1999 onwards, a range of Government service needs and platforms were identified and developed as a cross-Government initiative – from two common Web portals for all Government information and services (one for citizens, one for businesses) to the digital identification of online users, to secure communications and payments to Government. By 2002 an international e-economy benchmarking report recognised the UK as being in “... the vanguard of developing common IT architectures.” (BAH 2002:27). By 2003, there was a range of cross-Government platforms in use

(Mather 2003), largely operating under the “Government Gateway” branding, reflecting the 1999 3-tier architectural model:

Platform	Purpose
UKOnline (Citizen portal)	Cross-Government single portal to provide a one-stop shop for all Government information and services.
Registration / Enrolment	Identification and authentication services for online Government services, providing support for User IDs and passwords, third party digital certificates and (later) chip and PIN..
Transaction Engine	Handling of transactions between citizens, business and Government, including orchestration of services spanning more than one department or agency.
Secure Messaging	Providing two-way secure messaging via a web browser between citizens/businesses and departments and agencies.
Payments	Payments made by citizens and business to departments and agencies.

Table 3: Cross-Government platforms, 2003 (source: Mather 2003)

These platforms were an attempt at a transformational switch of the type set out in the third option of Table 2, providing a centrally directed move away from traditional department-focused silo working towards a cross-Government approach based around the provision of common services, data and processes. As POST had reflected in their options analysis of 1998, without this common approach, each part of the public sector would duplicate a range of technology and services within each agency and department and hence continue to provide a fragmented citizen experience as well as duplicating processes, roles, functions, expenditure and systems.

The approach taken by the UK Government reflects the process of decomposing complex processes into simpler ones that formed part of the move towards a so-called service-oriented architecture (SOA), which developed as a model to overcome the challenge of large and complex monolithic systems (Newman 2015). As Votisa et al. describe (2008), SOA enables monolithic architectures to be transformed into simpler building blocks, using appropriate technology to manage, combine, interface and diffuse these building blocks to ensure an adequate quality of service. The UK Government sought to exploit this model, breaking the architecture down into a series of small, composable services spanning areas such as identity, transactions, payments and secure messaging. The open standards regime provided by the GovTalk and eGIF processes was fundamental to this model, ensuring consistent, open Internet-based standards for interoperability for both data and APIs between all of the platforms.

These and other cross-Government platforms (for example, a web services broker, GIS system, re-useable rules engine, a forms engine, a forms store, a notifications engine: see (Mather 2003)) were similarly designed to expose open software interfaces to enable easy reuse and combination as required, with their open data formats determined through the GovTalk initiative (Cabinet Office 2004b). Although the core technologies of the initial Government Gateway transaction and identity platforms were provided by a commercial vendor, Microsoft (CNN 2001), the adoption of open standards and the use of technology-agnostic APIs enabled a wide range of systems to interoperate successfully with them, including Sun’s J2EE technology, IBM technologies, Apache, and Tomcat among others (IDABC 2007). This outcome reflected the practical value of the adoption of open standards in a complex multi-organisation domain.

The business benefits of these cross-Government platforms are described as being:

“... a modular ‘build once, use many’ architecture. The development of common IT standards across Government helps to avoid future rework costs associated with interoperability problems when joining up systems. The managed services are available to all other parts of

Government, without the need for complex procurement, providing scope for reduced costs, increased security and availability.” (Cabinet Office 2005b:18).

The engineering approach to cross-Government platforms was supported by a range of policies aimed at building a mixed economy in “the supply of e-Government services” (Cabinet Office 2003). These policies emphasised the importance of the involvement of private and voluntary sector intermediaries in the delivery of electronic Government services, building out an ecosystem and open marketplace of providers who could complement or offer alternative channels to the delivery and usage of online public services. The vision was to enable Government services to be obtained through an intermediary acting on behalf of a citizen or business, through an intermediary appointed by Government, or via using existing methods.

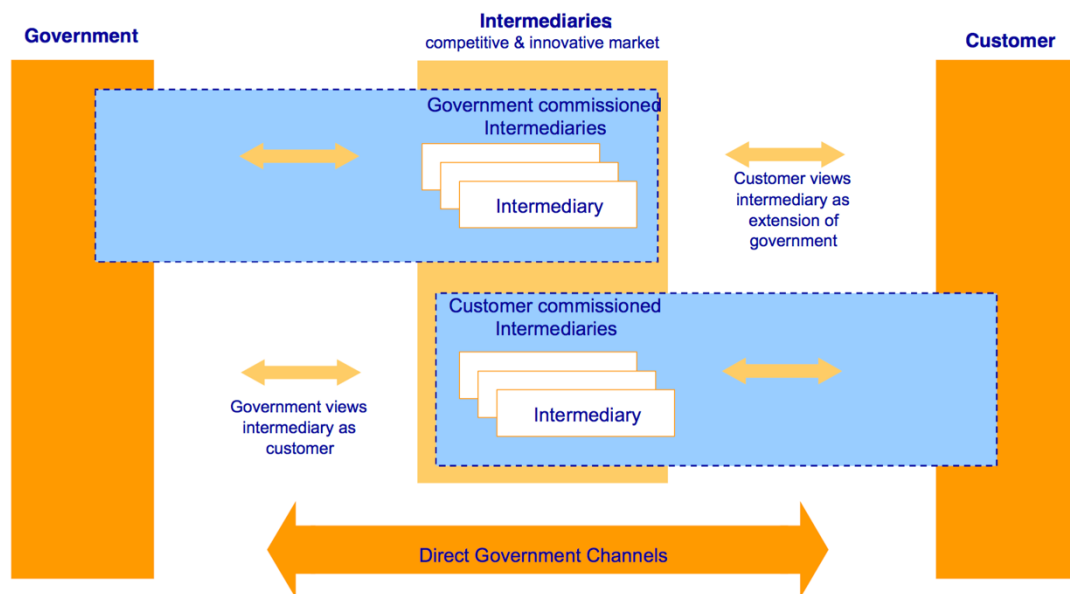


Figure 1: the intermediary model, enabling multi-stakeholder participation (2003, Crown Copyright)

The accompanying guidelines (Cabinet Office 2002:7) included recommendations that:

9. Public sector bodies should consider partnering with intermediaries to create opportunities to open up Government, and, where applicable, they provide a more appropriate route for delivering improved customer service and value for money.
10. Partnership decisions should seek to open up Government and not exclude competition in the intermediaries market, which is necessary to drive innovation, improved customer service and value for money. Public sector bodies should define the standards for interfacing with Government as part of the e-GIF process, to encourage competition and maximise customer choice.

3.2.2 Analysis

The period 1999-2010 involved the development of numerous common platform components and cross-Government infrastructure. It included an attempt to drive new delivery channels and alternative means of accessing and using Government services, enabled by the use of open technical standards (the purpose of the e-GIF initiative referenced earlier) and cross-Government platform engineering. The approach taken by the UK Government framed an explicit recognition of the need not only for a composable, modular, cross-Government architecture comprising loosely coupled layers of systems, communications, services, and data (Mather, 2003), but also the blurring of the traditional boundaries around the organisation of public services, with private and third party players actively encouraged to become part of the overall emergent ecosystem of electronic service delivery (Cabinet Office 2000). Thus an explicit understanding existed of the need to drive a wider, dynamic ecosystem essential to

the operation of successful platforms, and not just to focus on technology, in order to drive the significant, and ambitious, transformation desired in the design, operation and delivery of Government's services.

However, these initiatives encountered problems in driving sufficient take-up and adoption. In 2003, a former Director of the Cabinet Office's e-Delivery Team (eDT) (which pioneered the use of cross-Government composable platforms), identified one cause of the problems with take-up being the development of a central infrastructure that met the needs of some departments but not the majority and which had varying degrees of usage even by those departments that supported the need for it. It was seen by many departments and agencies as inflexible and, most problematically, required them to cede control of the processes they owned (Mather 2003:3). Mather also observed that despite eDT's best efforts in delivering these central platforms nowhere to be seen was the predicted reduction in administrative burden or the delivery of outright cost savings, whether this was savings achieved through re-use at a pure technology level, or organisational savings through reduced use of existing channels. Such problems encountered with using technology to attempt cross-Government transformation are not unique to the UK: "... the development of a federated architecture of information systems internally – to foster common standards, directories, and shared approaches [attempts] to achieve the internal capacity for an intra-Governmental conversation based electronically the fact that such conversations have rarely occurred, digitally or otherwise, in traditional models of public sector decision-making should underscore the enormity of the challenge." (Allen et al. 2003:96).

Despite these problems, elements of the UK Government's platform initiatives in the period 1999-2010 show a degree of alignment with all three elements of our PAF. On "organisational form", multiple stakeholder governance was established between the central team responsible for delivery and operational management of the central platform components and the users (departments, agencies and local authorities). It also demonstrated a concerted effort to address elements of the "market dynamic" of the PAF – particularly its focus on promoting the use of intermediaries on the demand-side of the platform. Some of the early successes in this area, such as the use of the authentication and transaction components to automate tax and other financial returns from external organisations and payments agencies to HMRC are still in use today (HMRC 1), making use of open APIs and open technical standards and demonstrating a degree of participation beyond Government. However, attempts to encourage a marketplace of third party identity providers failed: although originally user identification and authentication was intended to be via trusted third parties issuing digital certificates that would enable users both to authenticate digitally online and also authorise Government documents with digital signatures, the market defaulted in favour of the user ID and password combination made available by Government itself. Finally, the "architectural structure" displayed relatively high alignment – with the various components, such as the cross-Government network, Website, and authentication, transaction and payment services providing a set of modular interlinking processes based around shared infrastructure.

The UK Government in this period appeared to recognize the need to complement investment in a modular *architectural structure* comprising coupled layers of systems, communications, services, and data (Mather, 2003) with real efforts to blur the traditional boundaries around public services – with private and third party players actively encouraged to become part of the overall emergent ecosystem of electronic service delivery (Cabinet Office 2000). However, it seems that major change to the *market dynamic* and *organizational form* were highly challenging to achieve in practice, demonstrating significant difficulties in evolving a shared understanding and adoption of these last two dimensions of our PAF.

3.3 UK Government Platforms: initiatives from 2010 onwards

3.3.1 Narrative

More recent UK Government proposals for implementation of Government as a Platform (GaaP) have been led by the Government Digital Service (GDS), created in 2011 in response to a report prepared by Martha Lane Fox (Lane Fox 2010) – a report which continued to reflect the familiar optimistic assumption that technology-led change would enable a fundamental reform of public services. Amongst changes to the existing DirectGov Website, the report called for the appointment of “... a new CEO for Digital in the Cabinet Office with absolute authority over the user experience across all Government online services (Websites and APIs) and the power to direct all Government online spending.”

GDS was formed to take on the work of updating the UK Government’s online presence and to work on 25 exemplar projects with departments as part of the Transformation Programme (GDS 1), incorporating the existing role and functions of the Government Chief Technology Officer (CTO) within it. Prior to his appointment the CTO had been the lead author of a publication in 2010, “Better for Less”, that set out a platform-based approach to the reform of Government, including a specific annex on applying a service-oriented approach built on the adoption of open technical standards (Maxwell et al. 2010). Attention within GDS was initially directed towards developing a bespoke content management platform for a whole of Government Website, GOV.UK, to replace the existing, third generation cross-Government Website DirectGov. A major emphasis was also given to the use of open source software, with a commitment to “Use open source software in preference to alternatives, in particular for operating systems, networking software, Web servers, databases and programming languages.” (GDS 2). This was later modified to “Ensure a level-playing field for open source software. Demonstrate an active and fair consideration of using open source software – taking account of the total lifetime cost of ownership of the solution, including exit and transition costs.” (GDS 3).

In four areas, GDS cites examples of facilitating successful platforms: GOV.UK as a publishing platform (GDS 4), the Digital Marketplace, Performance (real-time data), and the emergent Verify identity assurance platform (GDS 5). The Verify programme (GDS 6) aims to replace the earlier Government Gateway identification, authentication and verification service which has been operating as a common shared platform infrastructure since 2001. Verify is being built by GDS working with Government departments and the private sector, using the same open technical standards as its predecessor to ensure a degree of continuity between existing and successor services.

In 2013, the Government Digital Service (GDS) published in its *Service Design Manual* (GDS 7) its intention to pursue the vision of ‘Government as a Platform’ (GDS 8), also highlighted in a video (GDS 9). It stated that a platform based initiative would not mean Government developing everything itself, with many of Government’s needs instead met by the use and consumption of existing utility services, emphasising its “cloud first” policy (Cabinet Office 2013). It set out a strategy for Government to use existing external platforms, such as payments services, and stated that developing platforms in-house would happen only where that was proven to be the best way of meeting users’ needs in the most flexible and cost-effective way. Another announcement about the commitment to GaaP was made in September 2014 in a blog entitled “More than just Websites” (Cabinet Office 2014). In a blog post in early 2015 GaaP was described as a “new vision for digital Government; a common core infrastructure of shared digital systems, technology and processes” (GDS 10). However, the approach described shares notably similar characteristics to the earlier work undertaken by the UK Government since 1999, and the preceding 2013 GDS announcement, namely to implement a platform infrastructure with a set of shared composable systems, technology and processes.

GDS identified the need for Government to “build a platform to host digital services” (GDS 15). An evaluation has been undertaken of several open source and commercial options to provide a platform as a service (PaaS). Alongside this core PaaS work, there has also been the development of a beta

payments platform (GDS 16; GDS 17). The intention is to make payments more convenient and efficient, removing the duplication of different Government organisations collecting money from people in different ways. The beta is being developed with several Government departments covering credit and debit card payments and is also exploring Direct Debit payments.

GDS' approach to Government as Platform (GDS 18) has identified potential benefits that are wider than the purely technical – e.g. for policy people, frontline staff, service managers and even ministers. It refers to the way in which shared components will enable new services to plug into and use the various platforms (e.g. payments, status notifications), stating that there is “No need to build your own bespoke notifications system, which again, would take longer and cost more.” Data is also referred to as being another shared component (“when we start building platforms” [our emphasis]) “maintained and curated by departmental teams who understand it best”. Not all components are technology – GDS has also put together design patterns (Alexander, 1999) and a development toolkit.

“Platforms give us a digital infrastructure to build services on: an ecosystem of components that’s not closed and locked away inside a proprietary stack of technology and processes, but based on standards and open to all. The entire public sector can use it.” (GDS 18)

GDS' approach (GDS18) asserts that “platforms stimulate markets, and markets drive innovation”, although the mechanism by which such stimulation and hence innovation will be achieved is not detailed. The questionable assertion is made that “If we create platforms based on open standards and interoperability, we automatically create competition and drive innovation. That means more providers and lower costs.” It also asserts that “Companies, charities, clubs and co-ops can use the same infrastructure to set up additional services that Government can't justify, or can't afford.” Verify (the cross-Government approach to citizen identity verification for online public services) is cited as an example – helping to stimulate the identity services market. It asserts that services can change as policy and circumstances change and that services built on platforms are much more flexible.

GDS' work on the new notifications platform focuses on status tracking and notifications to keep users informed of the status of their interactions with Government (GDS 19). The intent is to make it easy to “keep users informed via notifications – namely timely updates by text message, email and ... post”. Due to potential problems integrating such a service into existing backend systems, it plans to include an interface that lets notifications be sent directly without any integration.

Work has also commenced on registers, described as an “authoritative list of information you can trust” (GDS 20). Three different types of register are defined:

- open registers contain public data, and are open to everyone
- closed registers ask you to do something before you can access the data, for example pay a fee (as with seeing a Land Registry title) or provide a token (such as your driver number when using the view my driving record service)
- private registers contain sensitive information, but may be able to provide answers to simple questions, such as “Is this person registered as a potential organ donor?”, or “Is the registered keeper of this vehicle over 21 years of age?” without revealing further details about the individual

Data is a core feature of ensuring the right services are delivered to the right people at the right time, but currently data management in Government is complex. GDS aims to help move Government towards more standardised open data based around canonical registers. In August 2015, a blog by the Minister for the Cabinet Office stated “The work that GDS is doing, and the vision of Government as a Platform, is changing the core infrastructure of shared digital systems, technology and processes.” (GDS 22).

3.3.2 Analysis

Initial efforts by GDS continued to focus on the online (Website) experience of users of public services, rather than on the mapping and exploration of common processes, functions and data models. Yet we suggest that putting existing services online is not where the major benefits from a

technology-enabled transformation of public services can be realised: the major opportunity lies in the development of a cross-Government business strategy and information systems architecture (Stamoulis et al. 2001). GDS have been self-critical of aspects of their own approach. No overall standards, business, data or systems architectural model appears to have underpinned the exemplars: “Siloed approaches to transformation don’t work. Reinventing the wheel every single time we build a service has led to far too much duplication and waste.” (GDS 23). For its first few years the primary emphasis within GDS was on helping transition Government to another new Website presence and working with various departments and agencies on exemplars that would help show the art of the possible. The majority of these were Web-centric developments rather than platform based, and also less focused on the API-based and market dynamic elements that had characterised earlier UK Government work.

Latterly, GDS has proposed the building of a set of platform components in a manner which appears broadly similar to the approach adopted between 1999-2010: it posits the internal identification and development of a series of interoperable, cross-Government platforms that meet common needs across areas such as identification, payments, transactions and secure messaging, identifying the same core platform components as in the earlier period. It is unclear what mechanisms will be applied to make this repeat of the earlier approach more successful, and what account has been taken of the various elements of that earlier platform play that encountered difficulties. As Cordella and Bonina (2012) discuss, the use of IT-led change in the public sector and the digitalization of public administration have failed to account for the implications of changes in the structure of public administration on the quality and value of the public services involved. The assertion that a more efficient organisational procedure enabled by technology will automatically lead to better public services remains unproven, and challenged by the objective practical evidence of the past twenty or so years of attempts at technology-led reform. The focus on engineering technical platforms is at odds with Tim O’Reilly’s vision for GaaP, which recognises that the *architectural structures* of platforms themselves have little or no intrinsic value: value is only created when users interact – requiring, in the terms of our PAF, a platform-ecosystem *market dynamic* and collectively visualised *organisational form*. It is unclear from GDS’ announcements how these issues will be addressed, with the main focus apparently being on Government’s development of technology to meet a list of its own, internally identified, central needs. There is less clarity about the need for and motivation of an intermediary ecosystem for example than in the earlier period.

The GDS vision of GaaP appears to be currently in a state of flux, although it has recently secured a financial settlement of £450m for the remainder of the current Government’s term of office, in part to continue with development of the vision for GaaP (CS1). It is unclear whether the intention is to continue its approach of developing a series of cross-Government technically-led components to meet internal needs, or whether it intends to adopt the broader model of Government as a Platform set out in its own earlier vision of 2013 (GDS 13). Their 2013 vision implied a full comprehension and implementation of GaaP across *architectural structures*, *market dynamic* and *organizational form* dimensions of PAF, but this has been subsequently replaced by a largely empty Web page appearing to focus solely on *architectural structures*, simply stating “Services built on a shared core” (GDS 14).

3.3 UK Government platform initiatives: Summary PAF Analysis

Table 4 summarises our comparative analysis of the approach taken by UK Government during each of the two periods analysed, showing attention paid during the two periods to each of the three dimensions of our PAF. The comparison reveals apparent differences in conception of the role and operation of technology-driven platforms in public services. It reveals the period 1999-2010 to be characterized by a conception of a platform- and service-based *architectural structure* for Government spanning a mixed economy of public, private, and third sectors. The model pays explicit attention to the importance of published open standards in incentivizing a collectively visualized *organizational form*, and in promotion of a *market dynamic* underpinned by incentivized ecosystem – though realizing these last two dimensions of the model proved difficult to achieve in practice, arguably because of organizational inertia.

Table 4 shows the post-2010 period to have been characterized by a markedly similar conception of a platform-based *architectural structure*, which pays equal attention to the re-use of modular, interlinking processes across Government. However, in contrast to the earlier period, the available documentation indicates that the GDS vision of platform-enabled Government has focused primarily on the architectural dimension of our PAF framework, with relatively little attention being paid to the equally important dimensions of collectively visualised *organizational form*, and incentivized, plural *market dynamic*. This has resulted in an entirely different, more internally-focused flavour of platform-enabled Government which more closely resembles a “platform for Government” (Thompson 2015) rather than the more revolutionary “Government-as-a-Platform” blueprint for social exchange envisaged by O’Reilly.

Period of analysis	Organisational form ‘Platform-ecosystem as collectively visualise organisational form’	Market dynamic ‘Platform-ecosystem as complex dynamic of commoditisation and shifting incentives for participation’	Architectural structure ‘Platform-ecosystem of modular interlinking processes, enabled by shared infrastructure’
1999-2010	<p>Plural governance arrangements between the centre and Government stakeholders (Nielsen 2006; Ghazawneh 2015; Tiwana 2010)</p> <p>Explicit attention to evolution and broad dissemination of Government thinking and template for platform & standards (.e.g XML schema, eGIF, etc) within an ‘open architecture’ ensures some visibility of ecosystem & underlying architecture (e.g. Anderson 2014)</p> <p>Emphasis on adoption/re-use of open standards, rather than open source <i>per se</i>, across a collectively visualised organisational form (public/private/third sector): evidence that platform model is conceptualised as holistic ecosystem (e.g Ghazawneh 2015)</p> <p>Mixed model of bespoke build and consumption from broader ecosystem implies focus on platform as dissolved organisational form (e.g. Eaton 2015)</p>	<p>Defined intermediary strategy to encourage third party provision of services and ecosystem of third party identity providers, but without motivating incentives (Parker 2014)</p> <p>Use of an ecosystem of users particularly within the payroll and accountancy industries (Ghazawneh 2013)</p> <p>Recognition of existence within commoditising information infrastructures (Hanseth 2010; Wagelaar 2007; Jin 2008; Nielsen 2006) through use of commodity technologies</p> <p>Some evidence of market design activity and governance (e.g. Bichler 2012)</p> <p>Explicit attempts to promote mixed economy and associated trust (e.g. He 2008)</p> <p>Recognition of importance of ecosystem of intermediaries in driving innovation (e.g. Ghazawneh 2013)</p>	<p>Management of open APIs over c.15 year time span (Jin 2008)</p> <p>Unbundling of processes such as user authentication, transactions (messaging), payments (Nielsen 2006; Anderson 2014)</p> <p>Loose coupling of the various platform components, but ability to closely couple (e.g submission of the annual tax return ensures validation of its successful receipt) (Malhortra et al. 2005; Nielsen 2006; Tiwana 2010)</p> <p>Recognition of importance of interfaces (e.g. Jin 2008)</p> <p>Focus on modularity & process decomposition (e.g. Malhortra et al.2005) within SOA</p> <p>Focus on service outcomes (e.g. Nielsen 2006)</p>
2010-current	<p>Plural governance arrangements between the centre and Government stakeholders (Nielsen 2006; Ghazawneh 2015; Tiwana 2010)</p> <p>Emphasis on bespoke build in open source within Government suggests centralised organisational model (e.g. Nielsen 2006)</p> <p>Centralised dissemination of design patterns and standards aimed primarily at Government builders in contrast to holistic ecosystems with distributed rather than centralised governance (Nielsen 2006; Ghazawneh 2015; Tiwana 2010)</p>	<p>Currently building an ecosystem of third party identity providers (Ghazawneh 2013)</p> <p>Recent focus on design, build, and re-use of platform and components by and within public sector; this remains predominant focus with no evident mechanism for balancing supply- and demand-sides (Granados 2008; Bakos 2008)</p>	<p>Continuation of the approach of unbundling of processes such as user authentication, notifications, payments (Nielsen 2006; Anderson 2014)</p> <p>Platform infrastructure with a shared set of composable systems within PaaS (e.g. Malhortra et al.2005)</p> <p>Recognition of importance of interfaces (e.g. Jin 2008)</p> <p>Focus on service outcomes (e.g. Nielsen 2006)</p>

Table 4: Comparative analysis of UK Government’s approach to platforms using Platform Assessment Framework (PAF)

4. Discussion

Having derived our Platform Assessment Framework from the literature, its usefulness is shown in our analysis of the IT strategies of the UK Government during the period 1999-2010 and 2010 to date. Despite differences in conception and execution, Table 4 reveals that the UK's approach from 1999 onwards to establishing a set of cross-Government platforms is broadly aligned with the aspirations of the third option in the POST report of 1998 (Table 2). However, our analysis shows that whilst close attention to *architectural structure* laid the basis for common services that could be adopted by departments and agencies, the related *organizational form*, and supporting *market dynamic*, needed to bring about real change to the delivery of public services did not materialize – with resultantly limited adoption of these platforms. Our analysis reveals the UK Government's delivery of an *architectural structure*, but failure to stimulate a *market dynamic* or coalesce around a collective *organizational form* which in turn suggests that it was considerably easier for the UK Government to build technology than to change established organizational understandings and behaviours around technology. Several authors support this finding; for example, Margetts and Yared (2003) highlight the challenge for Government of incentivising citizens and businesses to use online services – particularly using inadequate assumptions that the use of digital technology will produce pre-determined and common organisational responses (also Margetts 1999). Whilst we do not claim that our three PAF themes, distilled from the IS literature, constitute a complete set of considerations for those implementing, and analysing, the use of platforms in Government, we believe that the PAF does offer a useful contribution in this regard.

The UK Government has itself previously recognised the challenge involved is not one primarily of technology, but of needing "... to work in new ways if the opportunities to improve public services are to be seized. It will need to re-invent how it works through stronger leadership from the top, clearer and more powerful incentives to change, radical shifts in arrangements for working across boundaries and a cultural change to support innovation" (Cabinet Office 2000:7). Similarly, Scholl (2005) notes that "A cultural change, for example, from a bureaucracy- centric to a service-oriented culture, [is] a major challenge," and "The elements of distributed control and accountability make [Government] intrinsically more complex than most private-sector BPC [business process change] projects". Notably, Government is not a single organisation but a series of parallel and sometimes overlapping organisations operating in a diverse and complex range of policy, regulatory and legislative environments: successfully implementing common infrastructure platforms within a single one of these would present an ambitious programme in itself, let alone the effort involved in creating a single central architecture to span them all. Difficulties with diverse technology, integration with the existing vertically-integrated and monolithic systems typical of many Government departments, legislative constraints, contractual and supplier boundaries and accountabilities, a lack of clarity about the granularity of the services, and difficulties of organisational and multi-stakeholder alignment in cross-Government initiatives are all potentially inhibiting factors, reflecting some of the complexity of cross-Government initiatives relative to other organisational contexts. As Zachman observes, "... public sector enterprises tend to be of the extreme complex variety [with] a wide variety of products and services ... The political issue tends to be who controls what which adds another dimension to the complexity" (Saha 2009:xvi). Yet it is notable that there continue to be repeated efforts to reform public services on the basis of purely technically-led efforts, despite this long-standing understanding that doing so often merely makes for effective "disaster faster" (Margetts & Willcocks, 1993).

Although GDS have referred frequently to Tim O'Reilly's vision for GaaP, their definition appears to be more narrowly focused on technical platforms rather than O'Reilly's wider definition of digital business models. Our Platform Assessment Framework reveals a potentially less well developed overall platform strategy in UK Government since 2010 than that prevailing between 1999-2010. O'Reilly's definition and vision is more comprehensive than either of these periods and is about far

more than the revealed current emphasis on architectural structure. An implication of the full GaaP model is profoundly radical, it would make the need for bureaucratic silos (such as Government departments and agencies) increasingly unnecessary, enabling citizens and frontline service providers to care, share and exchange goods and services with one another much more directly, innovatively and cheaply. The defining analysis underpinning O'Reilly's vision of GaaP, and repeated analysis of digital business models, is Eric Raymond's Cathedral and Bazaar paper (Raymond 2000), originally shared at the 1997 Linux congress. In it, Raymond tries to understand how the open-source Linux world *"not only didn't fly apart in confusion, but seemed to go from strength to strength at a speed barely imaginable to cathedral-builders"*. He concludes that given a set of openly available, standard tools, community organisations – the bazaars – will out-think, out-innovate and out-pace traditionally organised, top-down organisations – the cathedral-builders. Yet both, as in the physical architectural world, clearly have their place, with Government tending to default, for numerous reasons including those of a political, economic and social nature, towards the cathedral model. It is in determining when it might best apply the bazaar model and when the cathedral model that Government needs better tools: we hope our PAF will provide one such tool, but certainly not the only one.

Both Raymond and O'Reilly's visions share a fundamental commitment to a radically different mode of *organising*, in which the substantive element is the participative business model, rather than merely improved use of technology. We would recommend Governments choose a blueprint for GaaP that supports this focus on organising rather than continuing to focus primarily on the technology and what might be typified as a "build it and they will come" approach. The important distinction – between a blueprint for GaaP that supports participation versus one that supports mere access – is critical. The former is about democratic re-invigoration in which the Government provides a collectively visualised shared infrastructure, and incentivises participation and dynamic commoditisation – what we (following O'Reilly) would define as true Government as a Platform. The latter however is about the technology-led approach already attempted from 1994 in which Government seeks to acquire, or build for itself, technical infrastructure for Government.

Much of the activity we have observed in the UK is focused on the development of technical platforms rather than the more radical and disruptive vision of O'Reilly. Drawing upon O'Reilly's vision, and our PAF research, and synthesised through interpretation of the UK government's approach by the researchers, Table 5 summarises some of the key distinctions between platform for Government and the wider and more radical implications of Government as a Platform. In reality, given Governments' particular specialist needs in various areas, it is an intelligently blended mix of both that will be required.

Government as a platform	Platform for Government
'Bazaar' mode of organising (disruptive) (Raymond 2000)	'Cathedral' mode of organising (traditional) (Raymond 2000)
Open participation (Raymond 2000)	Open access
Active co-creation of services	Passive consumption of services
'Platform' is a business model	'Platform' is pieces of technology
'Agile' is about citizens organising differently	'Agile' is about Government tech responding to 'user needs'
Government stewards and enables civic marketplace	Government provides better access to its 'vending machine' of services
Platform-ecosystem economics (Government consolidates around standard business rules; market innovates continually around this demand)	Traditional economics (Government pays people to build, and run, its technology)
Focus on service outcomes; open standards	Focus on technology inputs; open source

Minimal technology and commercial legacy	Substantial technology and commercial legacy
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Table 5: Government as a Platform, or a platform for Government?

In Table 6 we highlight similarities between current and earlier visions, raising the question of how far the issues that Cordella and Bonina (2012) raise, and how far the vision of GaaP, have been understood and resolved.

1999-2010 vision and approach	2010+ vision and approach
<p>“... a step-change in the delivery and perception of integrated Government services, with commensurate cost-savings.”</p> <p>(source: Interactive Guide to Connected Government, p.9)</p>	<p>“A generational switch: Reforming silo working across Government through a platform-based approach”</p> <p>(source: Government as a platform speech by GDS’s Mike Bracken, June 2015, see http://www.publicsectorshow.co.uk/agenda/?tab=t6_s203)</p>
<p>“Common Infrastructure is ... a set of technology systems, underpinned by standards, created to meet the needs of a large set of Government organisations.”</p> <p>(source: Interactive Guide to Connected Government, 2005, p.24)</p>	<p>“...a new vision for digital Government; a common core infrastructure of shared digital systems”</p> <p>(source: Government as a Platform: the next phase of digital transformation, GDS blog, 29th March 2015)</p>

Table 6: Comparative analysis of past and current UK Government proposals

In 2002, the international e-economy benchmarking report noted that “Good, robust service provision, backed by a solid systems architecture and process redesign, is essential to achieve impact ... the fact that some of the first examples of impact are emerging from countries who came later to the process, emphasises the importance of applying lessons learned in other countries, and of customer centric service delivery around joined-up processes.” (BAH 2002:160). It appears however that at its creation GDS lacked situational awareness, with little attempt to map and understand the existing landscape, with the result that it failed to take sufficient account of both the UK’s own earlier leadership, work and lessons learned in attempting to develop cross-Government platforms; the considerable body of evidence and literature related to the efficient organisation and provision of technology, particularly in a Government environment; and the three characteristics essential to a platform play identified in our PAF. Rockart et al. (1996) identify a balanced approach between local and central that involves a “... devolution of systems analysis and consultancy activities to departments, functions, or processes, and a unifying central responsibility for strategy and operations. In other words, federal structures help achieve alignment with the business, together with economy of scale and architectural integrity.” (Rockart et al. 1996:21).

As our PAF indicates, the literature relating to successful industry approaches to platforms identifies that they depend not only technology components but also on a wider value-based ecosystem that brings together two or more sides to mutual benefit (section 2). It is unclear that the UK Government’s ambitious programme of platform-based, composable services offers sufficient value to potential participants, a shortcoming reflected in the observations of the Director of the Cabinet Office’s e-Delivery Team as long ago as 2003.

5. Conclusion and Recommendations

This paper provides an articulation of the scope of Government as a Platform (GaaP), spanning its technical and economic aspects, together with a typology of platform strategies for Government – spanning not only architectural structure, but also market dynamic and organisational form. This involved a review of information systems platforms literature from which we developed a Platform Appraisal Framework (PAF) incorporating the multiple dimensions that characterise business models

based on digital platforms. We then applied the PAF to analyse Government platform initiatives in the UK over two specific timeframes: 1999-2010 and 2010 onwards. This enabled the identification of several distinctions between both of these stages and the platforms literature; the current GDS emphasis on building technology platforms for Government; and GaaP.

As we describe in section 3, the UK Government at the technical level (architectural structure) developed many of the characteristics of a platform provider with a series of open components from 1999 onwards. However, despite its channels and intermediaries' strategies, arguably it failed to develop the wider market dynamic required to ensure its long-term sustainability and success. We do not believe this is necessarily an inherent failure related to the nature of Government's dominant player position: after all, many of the most successful platform providers occupy a similar, dominant status – companies such as Microsoft or Apple, for example, dominate within certain domains and have used their dominance to build dominance in other domains (e.g. Apple's move from iPods to dominate Music with iTunes). Rather, it reflects the repeated tendency towards assuming organisational and service change in Government can be led by technology, rather than only enabled and supported by it.

The approach adopted since 2010 and the creation of GDS also under utilises one of the main characteristics of GaaP: open participation. Our application of the PAF suggests the current understanding of market dynamics is less mature than during the earlier period, with the notable exception of the Verify identity programme's efforts to develop a marketplace of third party identity providers. In the development of its platform-based models, the UK Government has adopted an internally-driven, centralist top-down model without open public consultation and participation, proposing the development of its own technology to fit its own assumptions (which in turn, knowingly or not, mirror near identical assumptions from the period 1999 onwards). By ignoring the wider characteristics of successful platform implementation, it is effectively facilitating options and decisions about technology through internal networks of elites rather than the engagement of citizens (Jenson and Venkatesh, 2007). There is an opportunity missed to use GOV.UK as part of a broad participatory process to engage effective citizen, business and frontline employee involvement in the policy process relating to GaaP and to better understand user needs and the way in which a platform model can play a role in the provision of better, more timely and higher quality services.

There remain significant existential risks for Government of “getting pushed to the margins of a wired-up world while still relying on paper-driven processes” (Bastow et al 2000:22), an observation even more pertinent today, some 16 years after it was made. Whilst some Government processes have been redesigned through the use of technology, many of them still mimic the previous paper processes and have merely moved them online, failing to take advantage of technology to fundamentally rethink and design processes around service outcomes in the same way that NBT organisations have. If the current UK Government platform initiative is to succeed where earlier efforts failed, our PAF-enabled analysis suggests that it needs to understand the notable distinction between building technical platforms for Government, and implementing GaaP, and must work to resolve current areas of weakness.

As with previous efforts to lift private sector approaches into the public sector without differentiation, the use of platforms is likely to fail unless PAF-like tools are applied to understand where and how platform-based models might successfully be applied within the public sector. Such an undifferentiated approach appears likely to offer little greater success than earlier Government initiatives, such as Taylorism and New Public Management, to adopt private sector models to improve public services. Our comparison suggests however that this distinction is not well understood and that the UK risks continuing to repeat the mistakes of the past. To resolve this, we propose the use of our Platform Appraisal Framework as one means both of assessing current UK Government plans, as well as helping inform and improve the development and implementation success of those plans.

Although in this paper we have only considered the application of the PAF to UK Government developments, we believe its foundation in the IS systems platforms literature will make it more

generally applicable to the assessment and planning of platform initiatives elsewhere. We therefore propose this PAF as a contribution to the strategy and audit of platform initiatives, and more generally as an assessment framework for GaaP initiatives anywhere. We would welcome and encourage its utilisation and application elsewhere, and invite further research on experiences with its application in the field to lead its continuing refinement.

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